**LA-14028-PR**
**Progress Report**
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# Earth and Environmental Sciences

## PROGRESS REPORT 2001–2002

1943 - 2003
Los Alamos
NATIONAL LABORATORY
*Ideas That Change the World*

## Cover Photograph

***Valles Caldera, New Mexico, June 1991—taken during Space Shuttle Mission STS040***

The Valles Caldera, a remnant of the former Jemez Volcano, can be seen in this spectacular near-vertical-looking photograph. The caldera is an almost circular, cliff-ringed depression 14 miles (23 kilometers) across with forest-covered upper slopes and canyons. Only the base of the Jemez Volcano now remains. The volcano rose along faults that edged the west side of the Rio Grande Rift, now the Rio Grande Valley (visible to the east and southeast of the caldera). A composite volcano estimated to be about the size and shape of Mount Saint Helens in Washington, Jemez Volcano reached its maximum height 1 million years ago; shortly thereafter, it burst forth with two extremely violent eruptions, spewing out incredible volumes of volcanic gases, ash, pumice, and broken rock. The discharge of volcanic materials by these eruptions is thought to have been 100 times greater than the discharge of the 1980 eruption of Mount Saint Helens. Ash clouds drifted as far east as the area that now comprises Iowa, Missouri, Oklahoma, and eastern Texas. Other ash sped down the volcano's flanks, leaving great deposits at its base and in the surrounding region. These two massive explosions depleted the magma chamber far beneath the volcano. No longer supported from below, the volcano, ringed by fractures, collapsed, forming a vast caldera. The view of the caldera from one side of the rim to the other is blocked by the great dome of Redondo Peak and numerous smaller domes that squeezed up through circular faults on the edge of the caldera. The remaining level floor of the caldera is a vast grassland that is home to thousands of cattle.

Los Alamos National Laboratory, established in 1942 by the United States Government for atomic research and development of the first atomic bombs, is located on the east slope of the former Jemez Volcano.

Photo courtesy of National Aeronautics and Space Administration (NASA)

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## Abstract

This report describes the Earth and Environmental Sciences Division's progress in applied and basic science during calendar years 2001 and 2002. The report presents an overview from the division leader, Paul Weber; group and center descriptions; an update on our facilities; an overview of our patents and license agreements; funding sources and technical staff information; and research summaries of the science and engineering activities of each group within the division—Atmospheric, Climate, and Environmental Dynamics (EES-2), Hydrology, Geochemistry, and Geology (EES-6), Environmental Geology and Risk Analysis (EES-9), Geophysics (EES-11), and Carlsbad Operations (EES-12). It also contains an overview of the Institute of Geophysics and Planetary Physics (IGPP), the University of California's Los Alamos branch in a system of institutes for the study of geophysics and planetary physics. This report also includes highlights of some of our recent technical accomplishments. You may learn more from the cited references and by visiting our Web page at http://ees.lanl.gov or by contacting us through the EES Division Office, at (505) 667-3644. ■

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